Claims

1. A method for compensating a frequency offset in processing a received radio signal, wherein the receiving and the processing comprises the steps of

5 - receiving a radio signal having a carrier frequency from a radio channel,
- producing a local oscillator signal, wherein there is a frequency offset between the carrier frequency of the received radio signal and the frequency of the local oscillator signal,
- mixing the received radio signal with the local oscillator signal for producing a

10 baseband signal,
- converting the baseband signal into digital samples
- producing a radio channel estimation data,
- correcting the phase of the baseband signal on the basis of the channel estimation data,

15 **characterized** in that the method further comprises the steps of:
- detecting phases from successive channel estimation data,
- generating a complex phasor on the basis of said detected phases, and
- multiplying the baseband signal with said complex phasor for reducing the frequency offset of the baseband signal.

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2. A method according to claim 1, **characterized** in that the received signal is a spread spectrum signal and the method further comprises the step of despreading the received wideband signal to form a narrowband signal.

25 3. A method according to claim 2, **characterized** in that the step of multiplying the baseband signal with said complex phasor is performed to the wideband signal prior to despreading.

4. A method according to claim 2, **characterized** in that the received signal is a

30 spread spectrum signal and the step of multiplying the baseband signal with said complex phasor is performed to the narrowband signal after despreading.

5. A method according to claim 1, **characterized** in that the radio channel estimate data is made on the basis of the baseband signal that has been multiplied

35 with a complex phasor for frequency offset correction.

6. A method according to claim 5, **characterized** in that before the step of detecting phases the method comprises a step of forming a derivative signal on the

basis of successive channel estimate data, and a step of low pass filtering the derivated data.

7.   A method according to claim 5, **characterized** in that the after the step of detecting phases the method comprises a step of forming a phase derivative signal on the basis of successive detected phase values, and a step of low pass filtering the derivated data.

8.   A method according to claim 5, **characterized** in that before the step of generating a complex phasor on the basis of said detected phases the method further comprises a step of integrating.

9.   A method according to claim 1, **characterized** in that the method further comprises the steps of
- producing a first channel estimation data,
- detecting phases from successive first channel estimation data,
- generating a complex phasor on the basis of said detected phases from successive first channel estimation data,
- multiplying the baseband signal with the complex phasor for correcting the frequency offset,
- producing a second channel estimation data on the basis of the frequency corrected signal, and
- multiplying an uncorrected baseband signal with the second channel estimate data for forming a corrected output signal.

10. A method according to claim 9, **characterized** in that the after the step of detecting phases the method comprises a step of forming a phase derivative signal on the basis of successive detected phase values.

11. A method according to claim 9, **characterized** in that the before the step of detecting phases the method comprises a step of forming a phase derivative signal on the basis of successive channel estimate data.

12. A method according to claim 9, **characterized** in that the processing the baseband signal is made for at least two multipath components of the received signal, and the process of reducing the frequency offset is based on averaging at least one signal from the processing of the different multipath components.

13. A method according to claim 12, **characterized** in that the complex phasor is generated on the basis of frequency offset estimate values from at least two multipath components.

5   14. An arrangement for receiving a radio signal and compensating a frequency offset in processing the received radio signal, wherein the arrangement comprises
- means for receiving a radio signal having a carrier frequency from a radio channel,
- means for producing a local oscillator signal, wherein there is a frequency offset between the carrier frequency of the received radio signal and the frequency of the
10   local oscillator signal,
- means for mixing the received radio signal with the local oscillator signal for producing a baseband signal,
- means for converting the baseband signal into digital samples,
- means for producing a radio channel estimation data,
15   - means for correcting the phase of the baseband signal on the basis of the channel estimation data,
characterized in that the arrangement further comprises:
- means for detecting phases from successive channel estimation data,
- means for generating a complex phasor on the basis of said detected phases, and
20   - means for multiplying the baseband signal with said complex phasor for reducing the frequency offset of the baseband signal.

15. An arrangement according to claim 14, **characterized** in that the received signal is a spread spectrum signal and the arrangement further comprises means for
25   despreading the received wideband signal to form a narrowband signal.

16. An arrangement according to claim 15, **characterized** in that the arrangement comprises means for multiplying a wideband baseband signal with said complex phasor with the output coupled to the input of said despreading means.
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17. An arrangement according to claim 15, **characterized** in that the arrangement comprises means for multiplying a narrowband baseband signal with said complex phasor with the input coupled to the output of the despreading means.

35   18. An arrangement according to claim 14, **characterized** in that input of the means for forming the radio channel estimate data is coupled to the output of said means for multiplying the baseband signal with said complex phasor for reducing the frequency offset of the baseband signal.

19.   An arrangement according to claim 14, **characterized** in that it comprises a derivator that is coupled to the output of said channel estimator and a low pass filter which has an input coupled to the output of said derivator and an output coupled to
5   the input of said means for detecting phases.

20.   An arrangement according to claim 14, **characterized** in that it comprises a derivator that is coupled to the output of said means for detecting phases, and a low pass filter which has an input coupled to the output of said derivator and an output
10   coupled to the input of said means for forming a complex phasor.

21.   An arrangement according to claim 14, **characterized** in comprises an integrator for integrating the phase detected data, to form an error frequency value for the input of the means for forming a complex phasor.
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22.   An arrangement according to claim 14, **characterized** in that the arrangement further comprises
    - means for producing a first channel estimation data,
    - means for detecting phases from successive first channel estimation data,
20   - means for generating a complex phasor on the basis of said detected phases from successive first channel estimation data,
    - means for multiplying the baseband signal with the complex phasor for correcting the frequency offset,
    - means for producing a second channel estimation data on the basis of the
25   frequency corrected signal, and
    - means for multiplying an uncorrected baseband signal with the second channel estimate data for forming a corrected output signal.

23.   An arrangement according to claim 14, **characterized** in that it comprises a
30   derivator for forming a phase derivative signal on the basis of successive detected phase values.

24.   An arrangement according to claim 14, **characterized** in that it comprises a derivator with its input coupled to the output of said channel estimation means and
35   for forming a derivative signal on the channel estimation data prior to detecting phases.

25. An arrangement according to claim 15, **characterized** in that it comprises at least two rake fingers, and means for averaging at least one corresponding signal from the at least two rake fingers for the process of reducing the frequency offset.

5 26. A method according to claim 15, **characterized** in that it comprises means for generating the complex phasor on the basis of frequency offset estimate values ($\hat{f}_e$) from the at least two rake fingers.

27. A mobile station including an arrangement for receiving a radio signal and 10 compensating a frequency offset in processing the received radio signal, wherein the arrangement comprises
- means for receiving a radio signal having a carrier frequency from a radio channel,
- means for producing a local oscillator signal, wherein there is a frequency offset between the carrier frequency of the received radio signal and the frequency of the 15 local oscillator signal,
- means for mixing the received radio signal with the local oscillator signal for producing a baseband signal,
- means for converting the baseband signal into digital samples,
- means for producing a radio channel estimation data,
20 - means for correcting the phase of the baseband signal on the basis of the channel estimation data,
characterized in that the arrangement further comprises:
- means for detecting phases from successive channel estimation data,
- means for generating a complex phasor on the basis of said detected phases, and
25 - means for multiplying the baseband signal with said complex phasor for reducing the frequency offset of the baseband signal.

28. A base station including an arrangement for receiving a radio signal and compensating a frequency offset in processing the received radio signal, wherein the 30 arrangement comprises
- means for receiving a radio signal having a carrier frequency from a radio channel,
- means for producing a local oscillator signal, wherein there is a frequency offset between the carrier frequency of the received radio signal and the frequency of the local oscillator signal,
35 - means for mixing the received radio signal with the local oscillator signal for producing a baseband signal,
- means for converting the baseband signal into digital samples,
- means for producing a radio channel estimation data,

- means for correcting the phase of the baseband signal on the basis of the channel estimation data,

characterized in that the arrangement further comprises:

- means for detecting phases from successive channel estimation data,

5　- means for generating a complex phasor on the basis of said detected phases, and

- means for multiplying the baseband signal with said complex phasor for reducing the frequency offset of the baseband signal.